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POWER ON/OFF CIRCUIT APPARATUS HAVING A RESET FUNCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a power on/off circuit apparatus, which can turn on/off a power supply from an external power source to each electronic device based on an operation input of power switch, in electronic devices including a microcomputer.

2. Description of the Related Art

Conventionally, in electronic devices such as a DVD (digital video disc) player, a DVD-ROM (digital video disc-read only memory) drive and the like, when these devices are connected to an AC (alternating current) power source, a power is always supplied to a microcomputer. The microcomputer carries out a key scan sensing operation of a key matrix on which various input keys including a power switch are arranged, and then, makes an on/off control of power supply to individual electronic components when the power switch is operated.

Moreover, even when the power supplied to individual electronic components is turned off, the microcomputer is operating; in other words, these electronic components are operating in a power saving mode (key scan sensing operation is still continuing).

By the way, when the microcomputer hangs up due to any factors, key scan sensing operation is impossible, and even when the power switch is operated, the power of the these components is not turned off. For this reason, an AC code must be plugged out and in of a receptacle (plug socket) in order to cancel the above hang-up of the microcomputer.

In the case where the microcomputer makes a malfunction, there is a well-known technique of resetting the microcomputer without plugging the AC code out of the receptacle (e.g., refer to Japanese Unexamined Utility Model Publication No. SHO 57-204592).

However, according to the prior art disclosed in the above Publication, in the case where the microcomputer is reset by the power switch making a malfunction, the state of electronic components operating just before is lost; for this reason, a user must start the operation of electronic components at the beginning. Therefore, the user has a misunderstanding of making a power-on operation in spite of making a power-off operation from the power-on state by operating the power switch; as a result, the user has a strange feeling that something is wrong. Moreover, the electronic components are not operating in a power saving mode (key scan sensing operation is still continuing).

SUMMARY OF THE INVENTION

The present invention has been made in order to solve the above problems in the prior art. It is, therefore, an object of the present invention to offer a power on/off circuit apparatus, which can reset a microcomputer by a power switch without plugging an AC code out of a receptacle when the microcomputer makes a malfunction, and can memorize an operating state of components just before reset so as to start operating from the state before reset without a strange feeling.

In order to achieve the above object, according to one aspect, the present invention provides a power on/off circuit apparatus, comprising:

a power on/off circuit for controlling an on/off of power supply to electronic components from an external power source;

a microcomputer for controlling the power on/off circuit based on an operation input of a power switch,

a reset circuit for giving a reset signal to a reset terminal of the microcomputer when a power is supplied to the microcomputer; and

a non-volatile memory for storing a power on/off information just before the power switch is operated,

the power switch being connected to the reset terminal.

With the above construction, the microcomputer controls the power on/off circuit based on an operation input of the power switch, and carries out an on/off control of power supply to electronic components from an external power source.

In the case where the microcomputer runs away, when the on/off operation of the power switch is carried out, the microcomputer is reset, and further, an operating state of components just before the power switch is operated is stored in the non-volatile memory. Therefore, it is possible to transfer the components from a state of the equipment just before the operation to the next operation.

Moreover, preferably, when the power switch is operated, the microcomputer reads a power on/off information of the non-volatile memory so as to determine a power on/off state just before the power switch is operated, and writes a power-on information to the non-volatile memory while making a power-on operation if the microcomputer is in a power-off state. Further, the microcomputer writes a power-off information to the non-volatile memory while making a power-off operation if the microcomputer is in a power-on state.

By doing so, in the case where the state just before the power switch is operated is a power-on state, the microcomputer enters a power-off state.

Moreover, the power on/off circuit apparatus further includes a power circuit connected to an AC power source, and the power on/off circuit uses an output of the power circuit as a power source.

The E2PROM 14 is provided with a register for storing a parental lock data, which is one of DVD player functions and stop memory information, and a power on/off information just before the power switch 3 is operated. The microcomputer 4 carries out information write and read with respect to the E2PROM 14.

The procedure of the operation made by the microcomputer 4 in the above configuration will be described below with reference to a flowchart of FIG. 3

The AC input 10 (AC code) is plugged into the AC power source receptacle (#1) so as to turn on the power of the microcomputer 4 (#2).

By doing so, the reset circuit 5 is operated (#3), and then, the microcomputer 4 is initialized (#4).

The microcomputer 4 reads power on/off register information of the E2 PROM 14 (#5), and then, determines whether or not a register value is power-on (e.g., 1010).

Unless the register value is power-on (NO in step #6), the power-on information (1010) is written in the power on/off register of the E2 PROM 14 (#9), and further, a power-on operation is carried out (#10).

By the power-on operation, the microcomputer enters a power-on state, if the operation state just before the power switch 3 is operated is a power-off state.

On the other hand, if the register value is power-on (YES in step #6), the power-off information (0000) is written in the power on/off register of the E2PROM 14 (#7), and further, a power-off operation is carried out (#8). By the power-off operation, the microcomputer enters a power-on state, if the operation state just before the power switch 3 is operated is a power-on state.

Now, in the case where the microcomputer 4 hangs up due to any factors during the operation of components, in order to cancel the hang-up, the power switch 3 is depressed (#13).

In the conventional power on/off circuit apparatus, a power switch 3a is provided on the key matrix 8 of the microcomputer 4. For this reason, when the microcomputer 4 hangs up, key scan sensing operation is impossible; as a result, even when depressing the power switch 3a, the microcomputer is still hanging up.

On the contrary, according to the present invention, as shown in FIG. 2, the power switch 3 is not provided on the key matrix 8, and provided on the reset terminal RST of the microcomputer 4; therefore, it is possible to solve the above problem in the prior art.

Moreover, the microcomputer 4 is, regardless of the power supply of equipment a power on/off circuit 6 turned on or off, in a state capable of sensing a key scan of the key matrix 8 on which various input keys except the power switch 3 are arranged; therefore, electronic components are operating in a power saving mode.